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Perceived motivational climate, need satisfaction and indices of well-being in team sports: A longitudinal perspective

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Abstract

Objectives: Grounded in the self-determination and achievement goal frameworks [Ames, C. (1992). Achievement goals, motivational climate, and motivational processes. In G. C. Roberts (Ed.), *Motivation in sports and exercise* (pp. 161–176). Champaign, IL: Human Kinetics; Deci, E. L., & Ryan, R. M. (2000). The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry*, 11, 227–268; Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, MA: Harvard University Press], the purpose of this study was to examine the relationship between changes in perceptions of the motivational climate to changes in athletes' need satisfaction and indices of psychological and physical well-being over the course of a competitive sport season.

Design: A field correlational longitudinal design, including two data collections over the course of a competitive season, was used.

Method: Participants were 128 British university athletes (M age = 19.56; SD = 1.83). Athletes completed questionnaires assessing perceptions of the motivational climate; the need for autonomy, competence, and relatedness; subjective vitality and physical symptoms.

Results: An increase in perceptions of a task-involving climate positively predicted an increased satisfaction of the needs for autonomy, competence and relatedness. In turn, changes in the satisfaction of the needs for autonomy and relatedness emerged as significant predictors of changes in subjective vitality.

Conclusion: Findings suggest that for sport participation to facilitate athlete well-being, the sporting environment should be marked in its task-involving features.

Keywords: Perceived motivational climate; Need satisfaction; Psychological and physical well-being

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There seems to be general consensus, both in the research literature and among the lay public, that physical activity is good for one's psychological and physical health (Fox, Boutcher, Faulkner, & Biddle, 2000; Landers & Arent, 2001; World Health Organisation, 1995). For some, however, sport participation can lead to negative psychological and physical consequences, especially when such individuals experience pressure from significant others in the social environments (e.g. the coach or ones parents; Duda, 2001; Krane, Greenleaf, & Snow, 1997). Specifically, the motivational attributes of the sporting environment are presumed to play a vital role in influencing potential psychological, emotional, and physical effects (both positive and negative) of sport involvement (see Duda, 2001).

Although well-being has been conceptualised in different ways, most definitions emphasise positive psychological states as opposed to the absence of negative cognitions and feelings. Furthermore, according to Caspersen, Powell, and Merritt (1994), well-being is one of the two elements of quality of life and is concerned with the subjective internal states of the individual, or the way in which the individual feels physically and mentally. In their definition of health, the World Health Organization (WHO, 1997) recognises that mental well-being plays an all-important role in health measurements as they state that health incorporates "a state of complete physical, mental, and social well-being not merely the absence of disease" (p. 1).

One theory well suited to study the potential implications of social environmental factors on well-being in sport is the recently formalized sub-theory of self-determination theory (SDT) (Deci & Ryan, 1985, 2000), termed basic needs theory (BNT) (Ryan & Deci, 2002). BNT assumes three needs to be fundamental for the nurturance and growth of the human psyche: namely the psychological needs for autonomy, competence, and relatedness. The satisfaction of the need for autonomy involves the experience of choice and the feeling that one is the initiator of one's own actions, but also that one's actions are in accordance with one's values as opposed to being controlled by external forces or internal pressures (deCharms, 1968). The satisfaction of the need for competence is fulfilled by the experience that one can effectively bring about desired effects and outcomes (White, 1959). Satisfaction of the relatedness need pertains to feelings that one is securely connected to and understood by others (Baumeister & Leary, 1995). According to BNT, variations in need satisfaction will directly predict variations in indices of psychological and physical well-being (Ryan & Deci, 2002).

Applied to the domain of sport, satisfaction of athletes' needs for autonomy, competence, and relatedness via their sport environment should lead to higher levels of well being. To the extent that the needs are suppressed in the sport setting, inverse relationships are hypothesised. What is particularly attractive about the concept of need satisfaction is that it allows researchers to identify the environmental conditions under which the three needs could be satisfied and, in turn, promote well being.

One important social environmental factor assumed to nurture the fundamental needs is the motivational climate created by the coach (Ntoumanis, 2001; Reinboth, Duda, & Ntoumanis, 2004; Sarrazin, Guillet, & Cury, 2001). Coaches design practice sessions, group athletes, give recognition, evaluate performance, share their authority and shape the sport setting. In doing so, they create a motivational climate which can have an important impact on an athlete's motivation. Indeed, past work has suggested that the coach has a major influence on athletes' stress responses, reported enjoyment and feelings of self-efficacy in sport settings (e.g. Scanlan & Lewthwaite, 1986).

Grounded in the achievement goal framework (Ames, 1992), more or less ego-involving (or performance) and/or task-involving (or mastery) climates are hypothesized to exist and sport research has supported this supposition (e.g. Newton, Duda, & Yin, 2000). An ego-involving climate is characterized by interpersonal competition, social comparison and public evaluation. In contrast, an

emphasis placed on task mastery, learning, effort exertion and improvement distinguishes a task-involving climate (Ames, 1992; Newton et al., 2000). The motivational climate is assumed to promote the differential occurrences of task or ego states of involvement within the person. When task-involved, a person is trying to demonstrate mastery of the task rather than being focused on showing normatively high ability. In this case perceived ability is self-referenced and the person feels competent when realizing learning, personal improvement and mastering a skill with high effort expenditure. In contrast, when ego-involved, improvement, understanding and learning are seen more as a means to an end rather than outcomes in their own right. The individual in a more ego-involving context will try to demonstrate superiority and is therefore concerned about how able she or he is compared to others (Nicholls, 1989). Recent work has given insight into the underlying dimensions comprising task- and ego-involving climates in sport. In the majority of this research, the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) has been used to assess athletes' perceptions of the goal perspective(s) emphasised by the coach (Newton et al., 2000).

In a perceived task-involving sport environment, achievement is viewed in a self-referenced manner, which is considered to be more within the individual's control (Duda, 2001). Being in control of one's actions also increases the chances of feeling like the originator of one's own behaviour (deCharms, 1968) and, thus, would be expected to foster athletes' satisfaction of the need for autonomy. In contrast, a strong ego-involving climate is assumed to lead athletes to focus on outcomes more outside their personal control (e.g. beating others, attaining social approval and rewards; Duda, 2001). Therefore, perceptions of an ego-involving climate are expected to thwart the satisfaction of the need for autonomy.

According to Duda and colleagues (Duda, 2001; Duda & Hall, 2001), a task-involving environmental focus should foster perceptions of competence, because the self-referenced criteria (e.g. effort) underlying competence judgments and ensuing feelings of success are more controllable and readily achievable compared to normative-based criteria (e.g. winning). Also, the emphasis in such environments is on developing competence rather than protecting one's ability. In contrast, in an ego-involving climate, perceptions of competence are held to be more fragile because competence is construed on the basis of what others have done/are doing and there is greater preoccupation with the adequacy of one's ability (Duda & Hall, 2001).

With respect to the need for relatedness, the heightened inter-individual comparison and rivalry among athletes assumed to mark an ego-involving sporting atmosphere should undermine the sense that one is closely connected with others. In contrast, an emphasis on co-operation is fundamental to a task-involving environment. Thus, we would assume that a more task-involving climate should foster 'feelings of belongingness' and promote the satisfaction of the need for relatedness (Ames, 1992; Duda, 2001; Ntoumanis, 2001). In support of these assumptions, a study by Chi and Lu (1995) among intercollegiate basketball teams, found a moderate positive link between perceptions of a task-involving climate and reported task cohesion. A negative relationship emerged between perceptions of an ego-involving climate and task, as well as social cohesion.

Previous research in the physical domain has supported the aforementioned hypothesised assumptions, showing moderate to strong positive links between perceptions of a task-involving motivational climate and the satisfaction of the basic need for autonomy (e.g. Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Standage, Duda, & Ntoumanis, 2003), competence (e.g. Ntoumanis, 2001; Sarrazin et al., 2002), and relatedness (Sarrazin et al., 2002). In contrast, a rather weak negative link has been found between perceptions of an ego-involving climate and the need for autonomy and relatedness (Sarrazin et al., 2001).

Limited research has tested the relationship between need satisfaction and well-being in the physical domain. In a study by Ntoumanis (2001) in a PE setting, students' perceptions of competence and relatedness were positively related to intrinsic motivation which in turn was negatively related to boredom. Recently, a diary-based study by Gagné, Ryan, and Bargman (2003) found that daily need satisfaction predicted increases in daily well-being (e.g. subjective vitality and self-esteem) among young female gymnasts in the US. Similar results have also been found by Pensgaard and Duda (2003) among a sample of adolescent Norwegian elite athletes.

A cross-sectional study by Reinboth et al. (2004) involving British adolescent athletes found that features in the perceived coach-created sport environment (i.e. autonomy support, focus on improvement, and social support) were positively linked to the three basic needs (i.e. autonomy, competence, and relatedness, respectively), which in turn predicted indices of well/ill-being (e.g. subjective vitality and physical symptoms). Overall, there is a paucity of investigations that have examined the influence of perceptions of the motivational climate over time in the athletic setting (Duda, 2001). To the best of our knowledge, no study has attempted to test the theoretically assumed motivational sequence between the social environment, need satisfaction and well-being in a longitudinal design. Thus, it is not clear whether changes in coaching emphasis over time on ego-or task-involving structures may be linked to changes in athletes' reported satisfaction of the basic needs which in turn influences their well-being in sport. In the present study, we examined the links between perceptions of the motivational climate to need satisfaction and athletes' reported subjective vitality and physical symptoms over the course of a competitive season.

Despite the significance to the human experience and its prevalence in the literature, autonomy is a construct lacking theoretical homogeneity as well as a common operational definition (Hmel & Pincus, 2002). Even within the SDT framework, there are inconsistencies in its measurement. To date, research assessing the need for autonomy has measured this as a one-dimensional theoretical concept. However, Reeve (2002)[1] argues that the experience of autonomy is multi-faceted, and that it involves both the sense of realistic choice and decision-making, as well as the feeling of an internal perceived locus of causality (IPLOC) (e.g. feeling that one is the cause of ones' actions) (deCharms, 1968). In this study, we examined two aspects of the need for autonomy (choice and IPLOC) to indices of well-being. In previous research, the need for relatedness in sport has only been assessed with regards to other members of the team (e.g. Sarrazin et al., 2001). However, athletes also vary in the degree to which they feel connected to their coach (Jowett & Cockerill, 2003) and this relationship is meaningful to the quality of their sport experience. In the present study, relatedness was measured specific to the coach as well as with reference to one's team members.

In sum, the major purpose of the present study was to investigate whether changes in perceptions of the coach-created perceived motivational climate would be related to changes in athletes' satisfaction of the basic needs for autonomy (in terms of choice and IPLOC), competence and relatedness (with respect to team members and the coach) and indices of psychological and physical well-being over the course of 5 months during a competitive season**.** In line with previous research (Sarrazin et al., 2001; Standage, et al., 2003), we hypothesized that perceptions of a task-involving coaching emphasis over the course of

[1] Reeve (2002) argues that the experience of self-determination also revolves around a third aspect, volition. According to him, volition represents an unpressured willingness to engage in an activity. In our view, this definition of volition (freedom vs. pressure) is too closely tied to the IPLOC aspects of autonomy (which in our opinion already incorporates the freedom vs. pressure features) and we did therefore not include it as a separate dimension of experiencing autonomy.

the season would be a positive predictor of changes in the satisfaction of the athletes' needs for autonomy, competence and relatedness across the season. In contrast, it was predicted that the more ego-involving the climate was perceived to be, the less the needs would be satisfied. Need satisfaction in sport was, in turn, hypothesised to positively predict indices of well-being (i.e. subjective vitality) in sport and to negatively predict indices of physical ill-being (i.e. reported physical symptoms) over the course of the season. Based on the assumptions by Deci and Ryan (2000) that the IPLOC aspect of autonomy plays a more central role with regards to subjective well-being, we assumed the IPLOC aspect of autonomy to be a stronger predictor of indices of psychological well/ill-being compared to the choice/decision-making aspect. It was hypothesised that the two relatedness variables (e.g. coach or team-mates) would both emerge as positive predictors of indices of well-being and negative predictors of indices of physical ill-being. Based upon the predictions of SDT (Deci & Ryan, 1985), we hypothesised that the three needs would emerge as mediators of the relationship between the perceived motivational climate engineered by the coach and indices of athletes' psychological and physical well-being.

1. Method

1.1. Participants and procedures

One hundred and twenty-eight (89 females, 39 males; *M* age = 19.56; SD = 1.83) athletes from a large British university participated in this study. The present study included two data collections over the course of 5 months. Two hundred and fifty-seven athletes took part in the first data collection. An attrition rate of 48% at Time 2 was predominantly due to the absence from practice of the athletes in question on the day of the data collection. Using dummy-coding (stay vs. dropout) to test for possible differences among those athletes who took part in the second data collection (Time 2) and those who did not, we conducted a one-way MANOVA with age, type of sport, the perceived motivational climate, need satisfaction and well-being variables as dependent variables. No significant differences emerged $F(11, 237) = 1.54$, $p > 0.10$. In terms of ethnic background, the sample was primarily white English (97%). On average, the athletes taking part in this study had been participating in their sport for five years or longer (SD = 1.41). The participants represented a range of team sports including football ($n = 11$), rugby ($n = 23$), netball ($n = 20$), lacrosse ($n = 10$), and hockey ($n = 64$).

Convenient meeting dates and times were then arranged with the coaches. A multi-section questionnaire was administered by a research assistant either before or after a normal practice in a team clubhouse or a classroom. Two versions of the questionnaire (i.e. each with the measurement instruments ordered differently) were administered at each data collection to control for any potential order effects. At all meetings, instructions on how to fill in the questionnaire were given, emphasising that responses should reflect athletes' own perceptions of the sport experience/environment, that there were no right or wrong answers, and that all responses were anonymous. The terminology was adjusted for each sport (i.e. we used football for football players and hockey for hockey players, etc.). The questionnaire required approximately 20 minutes to complete.

Because we wanted to investigate changes in the study variables, data was collected at two points in time. The first data collection (Time 1) was conducted relatively early (6–8 weeks) in the season. The second data collection (Time 2) was carried out approximately 6–8 weeks before the majority of the teams finished their season. Currently, there exist no formalised guidelines regarding how long it takes

for the motivational climate or sense of relatedness to the coach, or other team-mates, to be established. According to some researchers (Miller & Roberts, 2004), the perceived motivational climate is likely to be established within 2–6 weeks.

When asked how long they have been playing on their current team at Time 1, 75% of the players indicated that they had done so for 2 years or longer. When asked about how long they have had their current coach, 81% answered that they have had the same current coach for at least 1 year. Overall it seems that most of the players on the team have had some time to establish relationships with each other as well as the coach. Based on the aforementioned information, there is strong reason to believe that the athletes have had enough time to establish relationships with both the coach and fellow team-members, and that the motivational climate had already been established at the time of the first data collection.

1.2. Measures

1.2.1. Perceived motivational climate in sport questionnaire-2

To measure the players' perceptions of the prevailing motivational climate on their respective teams, the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2; Newton, et al., 2000) was used. The PMCSQ-2 was designed to assess players' perceptions of the degree to which their respective team's motivational climate is characterized in terms of two higher order dimensions (task and ego-involving climate) which are composites of six underlying characteristics. Task-involving climate items reflect a sense that co-operative learning is encouraged, that each player has an important role on the team, and effort/improvement are emphasized. Ego-involving items tap the view that mistakes are punished, that recognition by the coach is reserved for the most talented athletes, and that a feeling of intra-team rivalry exists among players on the team. Due to the fact that our predictions stemming from achievement goal frameworks (Ames, 1992; Nicholls, 1989) are based on the higher order dimensions of the motivational climate, only the composite higher order scales were analyzed in the present study. Initial work on the PMCSQ-2 has found the instrument to have adequate internal reliability and factorial validity (Newton et al., 2000).

When completing the PMCSQ-2, the participants were asked to think about what the environment is like on their team in general. The stem for each question was: "On this team…'. Responses were indicated on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

1.2.2. Basic needs

Drawing from research assessing the satisfaction of the *need for autonomy* in the physical as well as other domains (Ntoumanis, 2001; Sheldon, Elliott, Kim, & Kasser, 2001) four items were used to tap into the IPLOC aspect of autonomy (e.g. "In football, I feel that my choices and actions are based on my true interests and values"). Drawing from the same sources, six items were used to assess the choice/decision-making facets of perceived autonomy (e.g. "I feel I can give a lot of inputs to deciding how the practice/training is being carried out"). The five-item perceived ability sub-scale of the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989) was used to determine the satisfaction of the *need for competence* (e.g. "I am pretty skilled at football"). The competence subscale of the IMI has demonstrated acceptable reliability with similar aged participants in previous research involving British athletes (Ntoumanis, 2001). Satisfaction of the *need for relatedness* in sport was tapped with the five-item Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998). This scale has

been found reliable and valid in the context of sport and physical activity (Sarrazin et al., 2002; Standage et al., 2003). To assess team relatedness, the stem for this scale was "With the other members of my team, I feel…". To tap into perceived relatedness with respect to the coach, the stem was changed to "In terms of my coach specifically, I feel…" The items used to assess perceived relatedness were: supported, understood, listened to, safe, and valued. All responses were indicated on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7), except in the case of the relatedness subscale, which was scored on a 5-point scale.

1.2.3. Well-being/ill-being variables

Subjective vitality in sport was measured using the 6-item version of the Subjective Vitality Scale (SVS; Ryan & Frederick, 1997). This instrument taps the degree to which participants feel physically and mentally vigorous and alert while participating in their sport (e.g. "In football I feel alive and vital"). In previous research, this scale has been found to be valid and reliable (Bostic, Rubio, & Hood, 2000; Ryan & Frederick, 1997). Responses were indicated on a 7-point Likert scale anchored by not at all true (1) and very true (7). To measure *physical symptoms*, participants completed the 9-item physical symptom checklist (Emmons, 1991) on which they indicated the degree to which they had experienced symptoms such as runny nose, headaches, stomach-ache/pain, in the past two weeks. Responses were indicated on a 7-point Likert scale anchored by not al all (1) to very much (7). During previous pilot testing of this measure with follow-up interviews, we have found that many participants felt uncomfortable or embarrassed by the question relating to the acne/pimples symptom. Because of this we decided not to assess this symptom. The eight categories were combined into a composite symptom measure.

Alpha coefficients for all scales at both Time 1 and Time 2 ranged from 0.75 to 0.92 and were deemed acceptable on the basis of Nunnally's (1978) criterion of 0.70 for the psychological domain.

2. Results

Means, standard deviations, and alpha coefficients for the study variables are shown in Table 1. On average, participants reported an increase in perceptions of the task-involving climate and a decrease in perceptions of an ego-involving climate from Time 1 to Time 2. They also reported higher levels of need satisfaction (i.e. autonomy, competence and relatedness), subjective vitality, and reported less physical symptoms across the same time period. Paired sample *t*-tests showed that all changes were significant ($p < 0.05$) except for assessments of perceptions of an ego-involving climate and coach relatedness. One-way MANOVAs (run separately for climate, need satisfaction and well-being variables) were conducted to test for possible type of sport differences (i.e. football vs. hockey). No significant differences emerged. We also examined the effects of gender on all the study variables. No gender differences were found. Therefore, the data were analysed across gender and type of sport.

Pearson product moment correlations at both Time 1 and Time 2 (see Table 2) revealed that in line with previous research (e.g. Newton et al., 2000), the two perceived over-riding dimensions of the motivational climate were significantly and negatively correlated. Perceptions of an ego-involving climate were unrelated to autonomy and competence, but significantly negatively related to both team and coach relatedness. A low to moderate correlation emerged between perceptions of an ego-involving

Table 1
Descriptive statistics and internal reliability of each measure

	Time 1			Time 2			
	M	SD	α	*M*	SD	α	*p*
Task-involving climate	3.79	0.38	0.81	3.86	0.40	0.84	0.05
Ego-involving climate	2.42	0.47	0.82	2.37	0.54	0.85	0.21
Autonomy (choice)	3.82	1.21	0.87	4.42	1.18	0.91	0.001
Autonomy (IPLOC)	5.18	0.96	0.80	5.40	0.94	0.86	0.05
Perceived competence	5.23	0.77	0.78	5.10	0.91	0.75	0.05
Relatedness team	3.84	0.59	0.86	4.00	0.56	0.87	0.01
Relatedness coach	3.64	0.65	0.88	3.72	0.67	0.92	0.20
Subjective vitality	4.97	1.07	0.89	5.23	0.98	0.92	0.01
Physical symptoms	3.10	1.04	0.79	2.62	1.03	0.80	0.001

climate and reported physical symptoms for Time 2 only. In contrast, perceptions of a sport-environment emphasizing task goals were significantly and positively related to all three basic needs and subjective vitality at Time 1 and Time 2, but were unrelated to reported physical symptoms. The three basic needs were positively low to moderately correlated with each other. They were also significantly positively related to subjective vitality and negatively associated with physical symptoms at both assessment times. The correlations between the two autonomy facets (choice and IPLOC) as well as between the coach and team relatedness ranged between 0.38 and 0.48 indicating that these facets were related and not redundant.

In this study, we used items to assess both the IPLOC and the choice aspects of autonomy. A principal axis factor analyses employing both oblique and varimax rotation were thus conducted on all the 10 items (for both Time 1 and Time 2) reflecting the two different aspects of the satisfaction of the need for autonomy in sport (i.e. IPLOC and choice/decision-making). As expected, two factors with eigenvalues above 1.00 emerged, collectively accounting for 61% (Time 1) and 68% (Time 2) of the variance, respectively. Orthogonal and oblique rotation produced very similar solutions and the interfactor correlations of the oblique rotation were all relatively low. As a result, the orthogonal results were maintained. All items loaded appropriately on the two proposed factors with factor loadings ranging from 0.55 to 0.88 at Time 1 and 0.64 to 0.85 at Time 2.

2.1. Motivational climate, need satisfaction, and well-being

A series of hierarchical regression analyses were performed to test the assumption that perceptions of a task-involving and ego-involving coaching emphasis over time would predict changes in the satisfaction of the three psychological needs across the season. The following procedure was used for each of the three basic needs: The corresponding Time 1 score of each need as well as perceptions of the motivational climate (task- and ego-involving) at Time 1 were entered first (step 1); perceptions of the motivational climate (task- and ego-involving) at Time 2 were entered second (step 2). This hierarchical approach to the analysis offers information about how changes in the perceptions of the motivational climate are linked to changes in athletes' reported need satisfaction over the season in that their scores at the beginning of the season were controlled for statistically. That is, the coefficients reported for

Table 2
Bivariate correlations among the study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Task-involving climate (T1)				–													
Ego-involving climate (T1)	−0.38																
Task-involving climate (T2)	0.46	−0.14															
Ego-involving climate (T2)	−0.13	0.46	−0.30														
Autonomy (Choice) (T1)	0.43	−0.13	0.09	−0.05													
Autonomy (Choice) (T2)	0.25	−0.04	0.39	−0.15	0.55												
Autonomy (IPLOC) (T1)	0.35	−0.14	0.21	−0.09	0.42	0.24											
Autonomy (IPLOC) (T2)	0.30	−0.01	0.58	−0.15	0.25	0.49	0.33										
Competence (T2)	0.16	0.08	0.21	−0.05	0.31	0.15	0.03	0.26									
Competence (T1)	0.17	0.06	−0.00	0.08	0.23	0.27	0.06	0.42	0.72								
Relatedness team (T1)	0.49	−0.34	0.30	−0.15	0.37	0.23	0.39	0.24	0.07	0.09							
Relatedness team (T2)	0.29	−0.26	0.55	−0.36	0.16	0.44	0.18	0.46	0.18	0.03	0.48						
Relatedness coach (T1)	0.54	−0.42	0.30	−0.25	0.39	0.32	0.16	0.16	0.13	0.11	0.39	0.30					
Relatedness coach (T2)	0.24	−0.07	0.54	−0.25	0.21	0.43	0.18	0.40	0.33	0.13	0.20	0.41	0.45				
Subjective vitality (T1)	0.38	−0.04	0.25	0.04	0.31	0.26	0.45	0.49	0.23	0.17	0.35	0.21	0.26	0.16			
Subjective vitality (T2)	0.27	0.07	0.59	−0.06	0.07	0.28	0.30	0.64	0.25	0.07	0.30	0.40	0.13	0.42	0.49		
Physical symptoms (T1)	0.10	−0.09	0.04	0.01	0.05	−0.09	−0.14	−0.07	0.09	0.18	−0.01	−0.07	0.01	0.11	−0.05	−0.10	
Physical symptoms (T2)	0.04	0.00	−0.15	0.19	0.00	−0.15	−0.14	−0.20	−0.02	0.10	0.03	−0.10	−0.11	−0.09	−0.04	−0.27	0.57

Note: Bivariate correlations of 0.18 and above are significant at the $p < 0.05$; bivariate correlations of 0.23 and above are significant at the $p < 0.01$ level.

the second step can be thought of as predicting residual variance in each interest variable, unexplained by the respective variables' initial level.

Results (Table 3) showed that perceptions of an increase in perceptions of a task-involving climate over the season explained significant variance in an increase in the satisfaction for the need for autonomy in terms of the IPLOC (Total $R^2=0.40, \beta=0.53, p<0.001$), and choice (Total $R^2=0.45, \beta=0.42, p<0.001$) facets; the need for competence (Total $R^2=0.57$, $\beta=0.21$, $p<0.001$), and reported team relatedness (Total $R^2=0.43$, $\beta=0.44$, $p<0.001$) and coach relatedness (Total $R^2=0.41$, $\beta=0.49$, $p<0.001$).

Table 3
Moderated hierarchical regression analysis for predicting basic needs

Variable	*B*	SE *B*	β	*t*	Unique R^2
Autonomy (IPLOC)					
Step 1					
IPLOC (T1)	0.26	0.09	0.26	2.93***	
Task-involving climate (T1)	0.56	0.23	0.23	2.43***	0.15
Step 2					
IPLOC (T1)	0.23	0.08	0.23	3.08**	
Task-involving climate (T2)	1.28	0.20	0.54	6.39**	0.25
Autonomy (choice)					
Step 1					
Autonomy choice (T1)0	0.54	0.08	0.55	6.68***	0.30
Step 2					
Autonomy choice (T1)	0.58	0.07	0.59	7.84***	
Task-involving climate (T2)	1.21	0.24	0.41	5.02***	0.15
Competence					
Step 1					
Competence (T1)	0.60	0.06	0.70	10.88***	0.51
Step 2					
IPLOC (T1)	0.61	0.05	0.72	11.71***	
Task-involving climate (T2)	0.41	0.14	0.21	2.97***	0.05
Relatedness (coach)					
Step 1					
Relatedness (coach) (T1)	0.51	0.10	0.50	5.02***	0.22
Step 2					
Relatedness (coach) (T1)	0.46	0.09	0.44	5.14***	
Task-involving climate (T2)	0.82	0.14	0.49	5.91***	0.21
Relatedness (team)					
Step 1					
Relatedness (team) (T1)	0.41	0.09	4.28	4.67***	0.24
Step 2					
Relatedness (team) (T1)	0.36	0.08	0.38	4.76***	
Task-involving climate (T2)	0.62	0.11	0.44	5.44***	
Ego-involving climate (T2)	−.18	0.08	−.17	−2.11*	0.21

*$p<0.05$, **$p<0.01$,***$p<0.001$.

Table 4
Moderated hierarchical regression analysis for predicting indices of well/ill-being

Variable	*B*	SE *B*	β	*t*	Unique R^2
Subjective vitality					
Step 1					
Subjective vitality (T1)	0.40	0.08	0.43	4.76**	0.29
Step 2					
Subjective vitality (T1)	0.25	0.07	0.27	3.37*	
Autonomy (IPLOC; T2)	0.45	0.10	0.43	4.71**	
Relatedness (Coach) (T2)	0.40	0.12	0.28	3.35**	0.26
Physical symptoms					
Step 1					
Physical symptoms (T1)	0.55	0.08	0.56	7.30**	0.35

*$p<0.05$, **$p<0.01$.

In contrast, perceptions of an increase in an ego-involving climate across the season predicted a significant decrease in team relatedness over the course of the season (Total $R^2=0.43$, $\beta=-0.17$, $p<0.05$).

Next, to test the assumption that changes in need satisfaction predict changes in indices of psychological and physical well/ill-being, subjective vitality and physical symptoms were regressed onto the separate need satisfaction variables (Table 4) using the same method as before. First, the corresponding Time 1 score as well as perceptions of the three needs at Time 1 were entered (step 1); perceptions of the three needs at Time 2 were entered second (step 2). Results showed that the satisfaction of the IPLOC component of the need for autonomy ($\beta=0.43$, $p<0.01$) and coach relatedness ($\beta=0.28$, $p<0.01$) across the course of the season were significant predictors of increased feelings of subjective vitality (Total $R^2=0.55$). Changes in the three needs did not emerge as significant predictors for changes in physical symptoms.

2.2. Tests of mediation effects

According to SDT (Deci & Ryan, 2000), the three psychological needs are assumed to mediate the relationship between social environmental factors (e.g. variations in the motivational climate) and well-being. The procedures suggested by Baron and Kenny (1986) were used to test this assumption. Accordingly, a test of mediation should include the three following regression equations: first, regressing the mediator on the independent variable; second regressing the dependent variable on the independent variable; and third, regressing the dependent variable on both the independent variable and on the mediator. Mediation is established if the following four conditions can be met: (1) the independent variable is related to the mediator variable in the first equation, (2) the independent variable must be shown to affect the dependent variable in the second equation, (3) the mediator has an effect on the dependent variable after the effect of the independent variable is taken into account, and (4) based on a comparison between results obtained under conditions 2 and 3, support for mediation is provided if the effect of the independent variable on the dependent variable is reduced after the effect of the mediator on the dependent variable is controlled for.

Table 5
Regression analyses testing mediation

Variable	B	SE B	β	t	Unique R^2
Equation 2: Subjective vitality					
Step 1					
Subjective vitality (T1)	0.41	0.08	0.44	5.23***	0.27
Step 2					
Subjective vitality (T1)	0.36	0.07	0.39	5.54***	
Task-involving climate (T1)	0.40	0.19	0.57	7.31***	0.24
Physical symptoms					
Step 1					
Physical symptoms (T1)	0.57	0.07	0.58	7.72***	
Equation 3: Subjective vitality					
Step 1					
Subjective vitality (T1)	0.36	0.08	0.39	4.24	
Autonomy (Choice) (T1)	−0.18	0.08	−0.22	−2.25*	
Relatedness (team) (T1)	0.32	0.16	0.19	2.01*	0.32
Step 2					
Subjective vitality (T1)	0.24	0.07	0.26	3.22*	
Task-involving climate (T2)	0.70	0.25	0.28	2.83*	
Autonomy (IPLOC) (T2)	0.33	0.10	0.32	3.35**	
Relatedness (coach) (T2)	0.26	0.13	0.18	2.08*	0.60

*$p<0.05$, **$p<0.01$, ***$p<0.001$.

Equation 1 Previous results (see Table 3) already showed partial support for the first condition of mediation, in that changes in perceptions of the motivational climate (task- and ego-involving features) were significantly related to changes in the satisfaction of the need for autonomy, competence, and relatedness.

Equation 2 Changes in subjective vitality and physical symptoms were separately regressed onto changes in perceptions of the motivational climate. Results showed that an increase in perceptions of a task-involving climate was a significant predictor of an increase in subjective vitality during the course of the season.

Equation 3 Subjective vitality and physical symptoms at Time 2 were separately regressed onto the three need satisfaction variables and perceptions of the motivational climate at Time 2, controlling for the corresponding variables at Time 1. Only subjective vitality partially met the demands of the third condition of mediation. As can be seen from Table 5, satisfaction of the need for coach relatedness at Time 2 as well as the IPLOC aspect of the need for autonomy were positive predictors of subjective vitality when controlling for the independent variables (i.e. perceptions of the motivational climate), thus, suggesting partial mediation. Also, the relationship between perceptions of the task-involving climate and the subjective vitality was weaker, although still significant, after taking into account the effect of the mediator (i.e. the three basic needs) into account.

3. Discussion

This study set out to investigate whether sport participation might play a role in contributing to or compromising health and how situational factors can influence the quality of athletes' sport experience

and subjective well-being. More specifically, we examined the relationship between changes in facets of the social environment perceived to be engineered by the coach (i.e. the task- and ego-involving features) to changes in need satisfaction and indices of psychological and physical well-/ill-being among university-team athletes over the course of a competitive season. No previous studies have examined this relationship using a longitudinal design.

3.1. Motivational climate and need satisfaction

In line with our hypotheses, the findings showed that an increase in the satisfaction of the needs for autonomy (both in terms of the IPLOC and choice aspects), competence, and relatedness (both team and coach) were all positively predicted by perceptions of the coach's emphasis on task-involving climate structures across the season. By reinforcing effort, personal progress, and the view that everyone has an important role on the team, an over-riding task-involving climate should maximize the opportunities to satisfy all the three needs. In contrast, perceiving the coach to emphasize ego-involving features during the course of the season was a significant negative predictor of team relatedness. Clearly, a team atmosphere which focuses on intra-team rivalry, outdoing others, and recognizing only the most talented players over time would be more likely to reduce feelings of relatedness between members of the same team.

Contrary to our hypothesis, perceptions of an ego-involving motivational climate did not emerge as a negative predictor of the need for autonomy and competence. This finding is, however, in line with the results by Standage et al. (2003) who did not find any link between perceptions of an ego-involving climate and the satisfaction of the three basic needs. A possible explanation for these non-significant findings may lie in the theoretical proposition of achievement goal theory suggesting that perceived competence would moderate the relationship of an ego goal emphasis on ensuing achievement-related affect, cognition and behaviour (Dweck, 1986; Nicholls, 1989). The findings also make sense from a practical perspective in that even though there may be a strong ego-involving environment operating on a team, it is quite plausible, at least for some players on a team, to have high perceived ability (e.g. if the team is winning). Also, it may be the case that the best players on the team are granted more autonomy (e.g. more involved in decision-making). However, good relationships with, and feeling valued and supported by other team members, does not seem to be compatible with an ego-involving climate.

3.2. Need satisfaction and well-being

In line with our hypothesis, as well as previous research (Gagné et al., 2003; Reinboth et al., 2004), the IPLOC aspect of the need for autonomy across the season, emerged as a positive predictor of an increase in subjective vitality from Time 1 to Time 2. This result is aligned with Ryan and Frederick's (1997) assumptions that an internal perceived locus of causality may play a particularly important role with regards to feelings of vitality. According to Ryan and Frederick (1997), only those with an internal locus of causality who feel like an 'origin' of their behaviour, will experience their energy as 'their own' and as emanating from the self and, thus, report higher levels of subjective vitality. These researchers have also proposed that subjective vitality is not directly influenced by physiological factors alone, but by the subjective meaning of these physical factors with regard to the self. For example, an athlete who feels compelled to practice her or his sport may perceive less energy available to her/himself compared to an

athlete who feels he or she practices her sport autonomously and wholeheartedly, regardless of observable effort or the objective caloric energy expenditure.

As hypothesised, the IPLOC aspect of autonomy emerged as the strongest (and the only) predictor of psychological well-being. Although perceptions of choice/decision-making were significantly correlated with subjective vitality, it seems that an internal perceived locus of causality is more relevant to feeling energetic and vital. For example, athletes who highly appreciate their coach's expertise and experience can choose to let the coach make the strategic decisions and still feel autonomous in the process. More research is needed, however, to test whether the choice/decision-making aspect of autonomy may possibly better predict other indices of psychological well-being such as enjoyment or self-esteem. It is also possible that the choice aspect may perhaps be a stronger predictor of well-being in individual sports.

In contrast to our hypothesis and previous research findings (Ntoumanis, 2001; Reinboth et al., 2004; Standage et al., 2003) perceptions of competence did not emerge as a significant predictor of subjective vitality or physical symptoms. However, the aforementioned previous research was conducted among younger adolescent-age club-athletes or physical education students. More research is needed to examine whether age or sport systems may possibly have an impact on the predictive value of the satisfaction of the need for competence. Finally, from a statistical perspective, entering all the three needs simultaneously in the regression analysis is a rather stringent test given the low to moderate intercorrelations between some of the needs.

In line with our assumptions, perceptions of coach relatedness across the season were also a positive significant predictor of an increase in subjective vitality from Time 1 to Time 2. Team relatedness did not emerge as a significant predictor of any of the well-being variables, despite being significantly correlated with subjective vitality. Again, a reason for this could be shared variance. However, one can argue that coach relatedness does to a large degree express something about the quality of the coach–athlete relationship. Several authors such as Jowett and Cockerill (2003); Mageau and Vallerand (2003) assert that the quality of this relationship is a central determinant of athletes' satisfaction and well-being.

None of the need satisfaction constructs emerged as significant predictors of physical symptoms. In line with arguments by Sheldon and Bettencourt (2002), this may suggest that need satisfaction constructs may be more relevant to understanding the presence of positive well-being than for understanding the absence of negative well-being. Stated differently, although one may be made happy by various types of satisfying experiences, it could perhaps be that other difficulties or problems (e.g. rundown with school schedule), that were not measured in this study, may influence one's physical ill-being. In the present study, ill-being was examined with respect to reported physical indicators only. It could be that the consideration of indices of psychological/emotional ill-being may have lead to an observed significant link to need satisfaction. Future research should explore this possibility.

The findings from the mediation tests partially supports the notion that intrinsic needs constitute mediators of the effects of social factors on individuals' psychological outcomes. Although some support has been found for the mediational role of intrinsic need satisfaction on motivation-related outcomes (Blanchard & Vallerand, 1996, cited in Vallerand & Losier, 1999), the current work extends this to the prediction of indices of psychological well-being in sport across the season.

No significant gender or type of sport differences emerged among the study variables. According to BNT (Ryan & Deci, 2002), the three proposed basic needs are assumed to be universal. Thus the relationship between need satisfaction and well-being should apply across ages and genders as well as across different types of sport. Although the means through which needs are satisfied may possibly vary

according to gender and context (e.g. sport, education), the underlying processes by which need satisfaction promotes health are assumed to be the same (Ryan & Deci, 2002).

Some limitations should be kept in mind and acknowledged when interpreting the current findings. Firstly, all measures in this study were self-reported. The attainment of objective evaluations of health status or observer reports of well/ill-being in addition to subjective ratings of well-being by the athlete would also have been desirable. In line with suggestions by Sarrazin et al. (2002), future research should consider attaining non-player based assessments of the context to more fully explore what contributes to the athletes' perceptions of the social context.

3.3. Conclusions and practical applications

Coaches are assumed to be actively involved in training and competition. They spend many hours interacting with athletes, and are assumed to play critical roles in shaping the quality of the athletes' sport experience (Gagné et al., 2003). It is, thus, important to examine the psychological training environment/climate they create over the course of the season (Ames, 1992), and how that environment relates to the well-being of athletes. To maximize the satisfaction of athletes' basic needs which in turn is expected to foster well-being among adolescents, the present research tentatively suggests that the task-involving features of the social environment should be kept strong and by no means neglected or downplayed. Perceptions of an ego-involving climate, on the other hand, appears to be linked to a lower sense of connection, value, and mutual support which in turn may have implications for athletes' feelings of energy and vitality.

One way coaches might satisfy athletes' basic needs could be by applying Epstein's (1988) TARGET (acronym representing task, authority, reward, grouping, evaluation and timing) dimensions to create a more task-involving motivational climate (see Ames, 1992; Treasure & Roberts, 1995, for a review). With the satisfaction of the three needs in mind, the *authority*, *evaluation*, and *grouping* structures may perhaps be particularly relevant.

Regarding the *authority* structure, giving athletes opportunities to actively participate and make decisions, should foster the choice/decision-making aspect of autonomy as well as increasing the chances of the 'origin experience' (deCharms, 1968) which could foster an internal perceived locus of causality. During training, coaches could let the participants set their own personal goals, let them choose what they would like to learn and monitor their own performance and progress. Moreover, our findings tentatively suggest that perceiving an internal locus of causality is the most important aspect of autonomy when it comes to athletes' psychological well-being. Although offering choice is relevant, the present results indicate that coaches should support athletes' autonomy by regarding them as individuals deserving self-determination, and not mere pawns that should be controlled to obtain a certain outcome (deCharms, 1968). Such an approach involves, for example, perspective taking and giving rationales for requested activities that athletes perceive as uninteresting. In western cultures, authority figures are expected to behave in a strong and influential way (Reeve, 2002). Research has also shown that people are often not conscious of their own controlling behaviour (Mageau & Vallerand, 2003). Coaches should, thus, try becoming more aware of, and try to avoid the use of controlling behaviours such as overt control, controlling statements and guilt-inducing techniques, over-emphasising tangible rewards, as well as power-assertive techniques that pressures others to comply (see Mageau & Vallerand, 2003 for a review).

Based on recommendations by Horn and Harris (1996), one way coaches could modify the *evaluation* structure, to seemingly increase athletes' perceptions of competence, could be to encourage athletes to

develop internalized performance standards. This can be done by involving athletes in self-monitoring of their exerted effort and evaluated their own performance. Positive competence feedback also plays an important role in enhancing athletes' perceived competence (Smith & Smoll, 1997). However, coaches should make sure they do so in an informational, non-controlling manner (Ryan, 1982).

Regarding targeting change in the *grouping* structure of the environment, coaches might encourage small-group learning as this has the benefit of encouraging co-operative learning and provide for positive social contacts (Johnson & Johnson, 1989) which can satisfy athletes' need for relatedness among team members. The result from the present study, however, suggests that feeling valued, listened to, and supported by the coach was more important with regards to athletes' well-being than team relatedness. In other words, these findings imply that team sport coaches should concentrate on creating a good coach-athlete relationship with each player. In order to achieve this, coaches may do well in providing athletes with social support such as accepting, caring for, and valuing players as people, not just as performing athletes.

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